Finally, AMTECH has serious questions about PacTel's 250 kHz "forward" channel. PacTel provides no justification why this outbound channel could not be contained within what PacTel calls its wideband signal. In fact, the presence of such a large forward channel suggests that PacTel's intended service offerings go beyond AVM applications to contemplate digital messaging. Unless PacTel intends to establish a "paging" or two-way messaging service, AMTECH notes that a 250 kHz bandwidth for simple polling is extraordinarily inefficient.[88] Ameritech's METS system also calls for ten 25 kHz forward channels. The FCC should carefully explore these designs and plans for the outbound channel and whether its planned use is consistent with current rules.

Thus, even viewed in its best light, PacTel's request for channel exclusivity appears prompted by a fundamental design flaw in its AVM system. Grant of PacTel's petition would reward unproductive technologies with favored access to scarce spectrum. The Commission should not bestow such a fragile system with a spectrum monopoly.

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In sum, PacTel asks the Commission to hand it 8 MHz and the right to be one half of a new service duopoly, without compensation to the public. Indeed, PacTel

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[88] PacTel's proposed use of 250 kHz as a "forward channel" is all the more striking in light of its recent filing in ET Docket 92-100 opposing grant of channels wider than 25 kHz in the adjacent 930 MHz band for proposed advanced messaging services. Reply of PacTel Paging, ET Docket 92-100, at 6 (filed June 16, 1992).

seeks to have its system enshrined, and its license made virtually permanent, despite the fact that it offers a remarkably fragile service to relatively few users. Doing so would effectively crowd-out other, perhaps more worthy, users of the band, such as AMTECH.

PacTel has not, however, met its burden of proof under either the Administrative Procedure Act or Section 7 of the Communications Act. Exclusivity in such circumstances would run afoul of the Commission's statutory mandate to promote the development of new technologies[89] and to encourage the large more effective use of radio techniques.[90] Accordingly, the agency should not countenance this proposal. Rather, the FCC should continue to license AVM systems in the 902-928 MHz band on a shared basis in order to maximize the full utilization of the band by a multiplicity of service and equipment providers. This approach -- tested by nearly 20 years of practice -- will best meet changing marketplace needs and encourage the development of technologies that make efficient use of spectrum.

V. POSSIBLE FCC ACTION

Although classed as "interim," the current policies have served the industry well for almost two decades by appropriately fostering the development of numerous, competing technologies. Whatever action it takes, the Commission should continue to

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[89] 47 U.S.C. § 157 (1988).

[90] 47 U.S.C. § 303(g) (1988).

promote a scheme where the AVM rules permit the marketplace to drive the technology and do not freeze industry development around any particular system. Nevertheless, AMTECH does not oppose initiation of an AVM rulemaking; a few clarifications to the existing rules might help all participants in a more evenhanded fashion than PacTel's proposals. AMTECH suggests the following principles that might be used to form any clarification or revision to the rules.

First, the Commission should clarify and reinforce the obligation of all AVM licensees to avoid interference. This obligation would befall both licensees and applicants, and would re-affirm the duty to cooperate mutually and in good faith to reduce interference concerns. As noted above, AMTECH and PacTel have already engaged in such discussions, and further conversations are underway even now.

Second, the Commission could explore more long-term options to ensure continued interference free operation of AVM systems. Specifically, the Commission could consider the possible role of a neutral frequency coordinating committee or performance of a similar role by the FCC. In addition, if sufficient industry consensus were present, the FCC could encourage development of technical principles for various types of AVM systems that would facilitate bandwidth sharing.[91]

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[91] For example, the FCC could develop rules that require HML systems that spread over a wide bandwidth to accommodate multiple systems and the presence of relatively low powered emissions such as AMTECH's. Similarly, modulated backscatter systems should anticipate the presence of spread spectrum HML systems and employ techniques such as frequency agile tags and the multiplexing of readers, where feasible, to facilitate operation in the same band by minimizing the amount of spectrum that is needed.

Third, AMTECH would support some limited rule changes that, while not affecting spectrum sharing, could improve AVM efficiencies and service to the public. Such changes could include the removal of the developmental licensing provisions applicable to operations in the 903-904 and 926-927 MHz bands. In addition, the Commission should consider redefining AVM service in a broader fashion to make clear that more than merely vehicles or other mobile objects can properly be located by AVM systems. The PacTel Petition appears to support these changes as well.

Finally, to increase user flexibility in a manner that would not foreclose sharing opportunities, yet provide increased access to the spectrum for all comers, the Commission should explore prospects for making the entire 902-928 MHz band available for non-governmental AVM systems. This would encompass two sub-parts: first, opening the band segments from 902-903 and 927-928 MHz; and second, allowing AVM licensees to use the mid-band region from 912-918 MHz. The Commission could then permit all applicants to utilize the entire spectrum. This would give HML systems such as PacTel the opportunity to spread their signal over more bandwidth, presumably making them both more accurate and less susceptible to interference. Given the same data rate, an HML system spread over 26 MHz should be more than three times as immune to interference than PacTel's current 8 MHz system. Systems such as AMTECH's could be licensed at any frequency (or multiple frequencies) in the 902-928 MHz band, but would pose a reduced threat of interference.

VI. CONCLUSION

The public interest has been well served by 20 years of flexible rules that have permitted market experimentation and growth in automatic vehicle monitoring. Spectrum sharing has permitted companies such as AMTECH to design low-power, efficient equipment that meets critical market needs. AMTECH and other companies have grown and flourished under these rules, and are important examples of American high-tech expertise with strong export potential.

PacTel would largely close the door on AVM development. It would lock-in a duopoly for HML systems, based partially on an inefficient, fragile system that, by all accounts, serves few customers. PacTel's request would inevitably constrain the ability of new entrants to gain access to the AVM band to offer innovative services. Thus, the Petition conflicts with the admonition in Section 7 of the Communications Act to promote new technologies and services. PacTel has failed to meet the heavy burden it faces to justify such a result.

AMTECH does not object to sharing the spectrum with PacTel's system as it already does with other systems. AMTECH does, however, vigorously resist the granting of monopoly rights in a service and in spectrum that is capable of supporting competition but that is not fully mature. Although some modification in the AVM services rules could encourage the continued flexible marketplace development of AVM

technology, PacTel's proposal will thwart, rather than promote, that objective. For these reasons, AMTECH respectfully requests that the Commission dismiss or deny PacTel's Petition.

Respectfully submitted,

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List of Attachments

ATTACHMENT A

USES OF THE AMTECH TECHNOLOGY

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USES OF THE AMTECH TECHNOLOGY

I. DESCRIPTION OF TYPES OF USES

A. Traffic Management and Highway Toll

Use of AMTECH's AVM technology for traffic management and highway toll systems typically involves installation of readers at points on highways, including at toll lanes. Tags are placed inside a vehicle's windshield, typically attached by Velcro®. They are illuminated and then "read" by readers as they pass in close proximity.

Often, the AMTECH system is used for toll collection. For example, on the North Dallas Tollway -- completely outfitted with AMTECH's system -- a vehicle equipped with a tag is identified by a reader as the vehicle enters a toll lane. This identification is passed to a computer, which determines the validity of the device for use at that toll facility and, in turn, causes signal lights, alarms, or gates to be activated based upon the validity tests. If the tag is valid, the vehicle's identification is stored, and the user's prepaid account is debited by the amount of the toll.[1] The result is a non-stop, cashless passage by the vehicle through the toll plaza. Not only does this save time for the user, reducing traffic congestion, it also conserves fuel and contributes to reduced automobile emissions. The Oklahoma Turnpike system is still more efficient. Cars equipped with an AMTECH tags need not even slow down or

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[1] Systems can also be configured to provide for later billing.

pass through a toll gate: overhead readers on high-speed lanes direct signals down toward cars to illuminate and read the tag.

Besides toll collection, the AMTECH technology is increasingly used in intelligent vehicle-highway system (IVHS) and traffic management applications. AMTECH systems using readers on bridges and other structures can track traffic patterns to provide a central location with accurate information on accidents and congestion. Such information can be used to change road signs, modify traffic signal patterns, or even to re-route vehicles. The California Department of Transportation will shortly issue a request for proposals (RFP) for the largest U.S. IVHS application to date, covering -- eventually -- all vehicles in California. Given substantial existing traffic problems in that State, such an IVHS system carries the immense potential to improve transportation efficiency and reduce auto emissions.

Highway applications such as IVHS and toll collection are also rapidly converging. Obviously, readers in toll lanes will, in addition to collecting tolls, measure traffic volume, thereby providing highway management information. AMTECH believes that highway systems of the future will combine toll and traffic management applications making traffic management relatively inexpensive.

AMTECH has already installed approximately 400 highway or toll readers. These systems already serve some 250,000 automotive users. Many of those users, such as commuters, rely on AMTECH technology every business day.

B. Rail

One of the most significant problems facing railroads today is monitoring and controlling rail stock. Rail cars can be pulled by locomotives and travel over lines owned by a company different than the ownership of the car. This results in enormous problems in the efficient management of rail stock, including outright lost rail cars.

Traditional methods for identifying locomotives and rail cars require a clerk or video camera manually to record identification numbers and then enter those data by hand into a computer. This system is inherently subject to delays and errors. A more recent, but severely flawed, identification method relied on "bar code" systems, which were tried for several years. However, problems of reading in inclement weather, maintenance, and the restricted amount of information that can be contained in large bar code panels limited the effectiveness of such systems. For this reason, the global rail industry increasingly has turned to AVM systems such as AMTECH.

There are two principal applications of AMTECH technology within the rail transportation segment. The first is automatic equipment identification (AEI) systems, which AMTECH and its distributors have been installing since 1986. This permits a railroad to install tags on locomotives and rail cars and to install readers at rail terminals and selected intermediate points. As the locomotive or rail car passes the reader, the reader retrieves the identification information and monitored status information in the tag and forwards this information to the railroad's computer network. In "read-write" AEI systems, the reader can also "write" new data into the

tag. The AMTECH system thus permits railroads to gather and disseminate data on a complete, accurate and current basis, resulting in better customer service and improved asset utilization.

In 1991, the Association of American Railroads (AAR) established a new AVM standard for virtually all North American rail cars.[2] The standard is based on the AMTECH technology and is expected to be implemented fully by 1995. The AAR standard is mandatory and applies to cars in Canada, Mexico and the United States. AAR and the railroads have already installed approximately 300 readers and 100,000 tags (predicted to be over 350,000 by year end). When the system is fully implemented, some 1.4 million pieces of rolling stock will be tagged. Each rail vehicle will have two tags (one on each side).

A second application of AMTECH's technology is automatic train control (ATC). This involves installation of readers on locomotives and installation of tags, programmed with location data, between the rails of the track. By placing the tags at specified intervals and wayside control points, a railroad can obtain real-time information concerning the location and movement of its rail equipment. The information can be used, for example, to maintain safe distances between trains and to ensure orderly flow of rail traffic on heavily traveled rail lines. AMTECH predicts that such systems will be increasingly examined in the United States; AMTECH technology already is employed for ATC in Europe and Australia.

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[2] Association of American Railroads, Specification for Application of Automatic Equipment Identification Transponders on Freight Cars, S-917-92 (rev. ed. May 1, 1992).

Both applications carry the potential of saving the rail industry tens of millions of dollars per year. The amount of savings jumps still further when rail AEI implementation is married to intermodal transportation AVM, discussed below.

C. Intermodal

Increasingly, AMTECH technology is used by the shipping, railroad, and trucking industries to facilitate the transport of goods worldwide using freight equipment -- containers, chassis, and tractors -- that can be carried on a variety of transportation media, called intermodal shipping. At present, there are over 4 million such containers, of which 60 percent are in the United States at any given time. Using the AMTECH AVM technology, a firm engaged in intermodal transportation can install tags on its containers, permitting readers at points of transfer and storage automatically to identify and obtain information about equipment moved among ship, rail, truck or other means of transportation and an intermodal container yard. An intermodal transporter can also track the containers within a yard.

Such operations are consistent with the increasing integration of all facilities involved in the movement of goods. In fact, the AMTECH system permits the "seamless" tracking of the movement of intermodal containers, regardless of the combination of ship, rail, truck or aircraft involved from its point of origin to its destination. As an example, through the use of six readers in proximity, complete

tracking information can be obtained regarding a dual-container stacked rail "flat" car, including the direction of travel at the highest of rail car speeds.

Through the use of software designed for the purpose, AMTECH can relay the data collected by the readers to its customers, enabling carriers, shippers, and consignees to obtain accurate and timely information about the status and location of their equipment and goods. Carriers are thus able to serve their customers better and to ship goods more efficiently, reducing costs to the public.

Underscoring the utility of AMTECH AVM for intermodal transportation is the fact that the voluntary standard of the International Standards Organization (ISO) for the automatic identification of intermodal containers adopted in 1991[3] and the similar U.S. standard adopted by the American National Standards Institute (ANSI) in 1990[4] are both fully compatible with AMTECH technology. Moreover, the AAR and ATA standards discussed earlier, which were developed concurrently with the ISO and ANSI standards, are also fully compatible with AMTECH technology.

Intermodal carriers have already begun installing readers for use on their premises and installing tags on intermodal freight equipment. (One AMTECH customer alone has over 10,000 tagged containers.) Within the next three years, AMTECH projects that the demands of this sector will increase to 500 readers and 250,000 tags, but could eventually cover hundreds of thousands more.

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[3] International Standards Organization, ISO 10374 (1991).

[4] American National Standards Institute, MH5.1.9-1990 (Oct. 15, 1990).

D. Trucking and Fleet Management

Another important market for AMTECH's equipment is vehicle fleet management and access control. As with the rail and intermodal markets, electronic identification of tractors, trailers, containers, converter dollies and related equipment allows fleet operators to increase productivity, improve equipment utilization, eliminate clerical and data errors, and enhance service to the public. In short, AMTECH allows the surface transport market to control its assets more effectively.

Already, AMTECH is serving common, contract and specialized motor carriers, transit systems, taxicabs, police cars and courier services. Automatic identification of equipment on arrival at a yard or terminal results in accurate and timely information for dispatch, yard operations, customer information services, and preventive maintenance. In some cases, scale weight and unit identification can be automatically combined to evaluate compliance with highway weight limits and the assessment of any user fees.

In August 1990, the American Trucking Associations (ATA) approved a voluntary standard for automatic identification of tractors, trailers and related equipment.[5] The standard is compatible with the AMTECH equipment, and is also compatible with the rail standards approved by AAR and the inter-modal shipping

[5] American Trucking Associations, Standard for Automatic Equipment Identification (May 16, 1990).

standard of the ISO. These compatible standards further reinforce the "seamless" market for tracking the international movement of goods however they may travel.

AVM systems such as AMTECH save time, simplify road use, provide tax recordkeeping and lower operating costs to shippers and public agencies. As one example, AMTECH's system permits the ready identification of trucks hauling hazardous material, potentially improving highway safety or permitting public safety officials more rapidly to assess the consequences of a transportation accident.

AMTECH technology is also valuable for controlling vehicular access to restricted areas. Access control applications include gated communities, parking lots and military bases. Of course, access control can be combined with other information, so that user tags transmit information about the length and status of a trip as a truck rolls into the freight yard.

At present, several trucking and surface transportation providers rely on AMTECH equipment. Numerous readers have been installed throughout the U.S, and over 40,000 trucks have been tagged. AMTECH expects this market to grow, particularly as the ATA standard is implemented.

E. Air Transport

The AMTECH technology has many applications involving the air transport industry. In particular, airlines typically use so-called unit load devices (ULDs) as a standard pallet for transport of freight and baggage in aircraft holds. AMTECH's

technology is compatible with a voluntary recommended practice for electronic identification of airfreight containers worldwide. This standard, established by the International Air Transport Association (IATA),[6] is intended to harmonize shipments and ULDs throughout the world, saving airlines millions of dollars.

Beyond this, AMTECH products are already in use at numerous airports throughout the world to improve vehicular safety, security and efficiency in at least two ways. First, airport authorities carefully control the vehicles that have access to gate, runway and tarmac areas. AMTECH systems allow precise identification of such vehicles at a given location and can control gates and traffic signals. Second, AMTECH systems have been used to streamline taxi queues by automatically identifying valid taxicabs, decreasing taxi congestion in airport areas, and billing for any user fees. Airports also use AMTECH systems to manage, track, and bill other commercial vehicles. Approximately 13,000 AMTECH tags have already been installed to meet such airport needs.

F. Other

In addition to the foregoing, the AMTECH technology has several other possible uses that, although not yet implemented, promise tremendous improvements in business efficiency and safety. One of the most obvious is the use of modulated backscatter readers and tags for personal access control, a use the Commission may not

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[6] IATA Standard and Recommended Practice RP 1640 (1991).

have predicted when establishing its AVM licensing regulations. As noted above, AMTECH systems already perform access control at airports for vehicles. The system could be easily modified to provide personal security or individual access control. AMTECH tags are already small enough to be used as access cards, and may soon fit within a standard wallet. This would permit the same system to be used for vehicular and personal access and security. Because an AMTECH tag could be read even if it were inside another object, in might also obviate the need to remove an access card from a briefcase or wallet.

Another exciting potential application requires only a slight modification to existing IVHS offerings. By increasing the amount of information transmitted to a read-write tag (i.e., through an increase in the data rate), the AMTECH system could be used not only to monitor vehicles but to send instructions to be forwarded to some in-vehicle processor. Such instructions could advise the driver about road hazards or, in the future, even control functions of the vehicle itself.

These are applications for the future. Nonetheless, they illustrate the promise and potential scope of systems such as AMTECH's.

II. EXEMPLARY AMTECH PROJECTS

Under the licensing supervision of FCC staff, AMTECH's installations in the U.S. have grown enormously. Moreover, AMTECH has had unique success in foreign markets. The following are representative applications of the system; however, this is

not a comprehensive list. All the installations listed below are actually in operation. Many further projects are already contracted for or planned.

- Highway
  - Crescent City Connection Bridge, and Lake Pontchartrain Causeway, New Orleans: AMTECH readers are installed in all twelve lanes of the newest bridge spanning the Mississippi River and on six lanes on the Causeway bridge, the world's largest double span bridge. More than 41,000 toll tags in total have been issued to date for both systems, and the same tag will work on either bridge. Over three and a half million tag crossings have been recorded on the Crescent City bridge since January 1989. Nearly half of the Causeway crossings (26 miles) are by toll tag users, and the tag registrations indicate a penetration of the commuter market exceeding eighty percent.
  - Autopistas, Barcelona, Spain: 28 electronic toll collection lanes, soon to be 28, are installed on 3 separate highways, permitting a single tag to be used on all three roads. Nearly 9,000 vehicles are equipped with tags already; over 20,000 tags are expected to be issued before the end of the year.
  - Oklahoma Turnpike Authority: The world's largest AVM toll collection system has been installed throughout the Oklahoma Turnpike: 219 lanes on 585 miles of road. To date, over 130,000 tags have been issued (250,000 are expected to be issued by year end), permitting users to continue on the turnpike at highway speeds while an overhead tag reader automatically records and bills their account. Non-tag users, by contrast, must exit the highway for manual payment collection. As stated in Attachment B, the Turnpike Authority predicts there will be 20 million toll transactions recorded in 1992.
  - Esterel-Cote d'Azur Toll Agency, Cannes, France: AMTECH technology has been installed on the 155 mile highway traversing the French Riviera. Due to the system's success, one lane has been designated for tag users only, permitting high-speed identification. Equipment to expand the system to 10 lanes should soon be in operation. More than 16,000 tags have been issued, generating over 40,000 daily transactions.

- Dallas North Tollway: AMTECH equipment has been installed in 63 lanes, distributed over 16 toll plazas of the 25 mile tollway. As stated in Attachment C, the system has nearly 50,000 tagged vehicles, registering 20 million transactions per year.

- Republic of Mexico (CAPUFE): AMTECH automatic toll collection equipment has been installed in 134 lanes at 58 locations throughout Mexico. The federal toll administration for the Republic of Mexico operates 14 toll roads and 32 toll bridges; the AMTECH equipment handles about 13 million transactions per month.

- Railroad

  - North America: AMTECH tags are in use by CSX Transportation, Consolidated Rail Corp., Norfolk Southern Corp., Santa Fe Railroad, Union Pacific Railroad, Trailer Train and Burlington Northern. The railroads have over 100,000 tags in place in North America now. As a group, North American railroads are adding tags at a rate of at least 30,000 per month.

  - Foreign: Several foreign railroads, including the French National Railroad (SNLF) and Australian systems, use the AMTECH system for rail stock monitoring and/or automatic train control. Some of these products are manufactured in Spain through an AMTECH/ALCATEL joint venture.

- Intermodal

  - American President Lines: To date, AMTECH has installed over 25,000 tags on containers, chassis, trucks and generator sets for American President Lines (APL) located in Seattle, Washington. Reader Systems are in operation at 10 gates at APL's Seattle terminal, on gantry container cranes, and on top-pick cranes.

  - Matson Navigation Company: AMTECH has equipped Matson's Honolulu (Sand Island) intermodal terminal with nine reader systems, 3,500 transportation tags have been installed on over-the-road trucks (which are compatible with the American Trucking Association's AEI Standard), intermodal chassis, and generator sets.

- Port of Singapore Authority: AMTECH systems provide gate control at the world's busiest container port, including automatic processing of all trucks entering and exiting the Port terminal facility. AMTECH has installed reader systems at 18 gates and lanes and more than 10,000 prime movers have been tagged.

- Trucking and Fleet Systems

  - British Petroleum: More than 50 BP terminal fueling sites across the United States will be equipped with AMTECH readers by the end of this year. The system permits BP to ensure its trucks conform with Department of Transportation, EPA and OSHA standards as they enter the fueling yard.

  - State of New Mexico: AMTECH readers and tags permit trucks to be weighed in motion, reducing traffic delays.

  - Holon, Israel: This town uses the AMTECH system to track waste management trucks, permitting only authorized vehicles access to waste disposal sites and recording the weight of the waste.

- Airport and Air Transport

  - Los Angeles International Airport: LAX tracks more than 5,500 terrestrial commercial transportation vehicles that are permitted on airport grounds. The AMTECH system provides entry and exit records (for security purposes) and collects user fees. The number of daily transactions is more than 45,000. Compatible expansion systems have been installed at nearby John Wayne and Ontario Airports.

  - Dallas/Fort Worth International Airport: DFW uses AMTECH technology to validate vehicle airport access, control barrier gates, and control vehicular access to security-sensitive areas. More than 2,200 vehicles have been tagged, and over 50 lane installations have been completed.

  - JFK International Airport: AMTECH equipment has been installed at 36 locations to monitor schedule compliance for the terminal shuttle buses. There are current studies to expand the system to include additional lanes and tags for taxicabs.

- Japan Air Lines: The AMTECH system permits JAL, the primary domestic airline carrier, to track aircraft containers at Chitose, Haneda, Osaka, Fukuoka, and Okinawa airports. Over 4,000 containers can be processed at 4 stations, and the system automatically bills shippers and assigns space in aircraft cargo bays according to safety and aircraft weight and balance criteria.

ATTACHMENT B

OKLAHOMA TURNPIKE AUTHORITY